

Applicant: Anil Nadkarni, *et al.*  
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68. (New) The bullet of claim 55, wherein the powder is a prealloyed bronze containing 10 percent by weight tin.

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69. (New) The bullet of claim 55, wherein the powder is a prealloyed brass containing 30 percent by weight zinc. --

REMARKS

The claims are 1-66. Claims 1,3, 7, 9, 13, 15, 17, 19, 21-24, 26, and 35 have been amended to more clearly and particularly define embodiments of Applicants' invention. New claims 53 to 66 have been added to more fully claim embodiments of Applicants' invention. No claim has been cancelled.

Independent claim 1 has been amended to include the recitation that the frangible bullet is manufactured by partially impeding the sintering either (i) by the addition of a frangibility effecting additive to a copper-containing powder, (ii) through control of density of the pressed powder compact, (iii) through control of sintering temperature or time, or any combination of (i), (ii) and (iii). Independent claim 26 has been amended similarly to recite that, in the claimed method, the sintering is partially impeded. Support for this recitation is provided by the application as a whole; in particular, at page 8, lines 7-13. Accordingly, no new matter has been added by these amendments.

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Claims 3, 7, 9, 13, 15, 17, 19, and 21-24 each have been amended to change their dependency from claim 1 to new claim 53. Thus, all of claims 3-25 now depend directly, or indirectly, from new claim 53, which in turn depends from claim 1. Claim 53 recites that the sintering is partially impeded by the addition of a frangibility effecting additive which may be any one, or more, selected from the group consisting of oxides, solid lubricants, nitrides, carbides, and borides. Support for new claim 53 appears, *inter alia*, at page 8, line 3 to page 9, line 13; Examples II-V, and the original claims.

Claim 35 has been amended merely to more particularly state that the copper or copper alloy powder comprises a “frangibility effecting” additive. Support for this amendment appears beginning at page 8, line 9, *et seq.*

New claim 53 has been discussed above.

Claim 54, dependent from claim 26, has been added to more specifically claim the embodiment wherein the sintering is partially impeded through control of density of the pressed compact powder, or through control of sintering temperature or time, or any combination thereof. Support for new claim 54 is as for amended claim 26 from which it depends.

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New claim 55 depends from claim 1 and is directed to a bullet manufactured by partially impeding the sintering through control of density of the pressed powder compact, through control of sintering temperature or time, or through any combination thereof. New claims 56-61 depend directly, or indirectly, from claim 55 and correspond to original claims 7, 8, and 21-14, respectively. New claims 62-66 also depend from claim 55 and are directed to embodiments exemplified by Example VI.

Accordingly, with the present amendment there remains three independent claims, 1, 26 and 35 directed, respectively, to a frangible bullet, a method of making a frangible bullet, and a powder useful for manufacturing a frangible bullet. Further, two main claims depend from claim 1: claim 53 directed to a frangible bullet manufactured by partially impeding sintering by the addition of a frangibility effecting additive, and claim 54 directed to a frangible bullet manufactured by partially impeding sintering through control of density or control of sintering temperature or time, or any combination thereof. No new matter has been added by the amendments.

Claims 1-3, 9, 10, and 24-26 stand rejected under 35 U.S.C. § 102 as being anticipated by Great Britain Patent No. 531,389 (Woodworth) and claims 11, 12, 21-23, and 27-34 stand rejected under 35 U.S.C. § 103 as being obvious over Woodworth, either alone, or in view of

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disclosure in the *Condensed Chemical Dictionary*, 10<sup>th</sup> Edition (1981).

It is said that Woodworth discloses a bullet comprising 90 percent by weight copper which bullet is formed by pressing a powder comprising copper in a die and sintering. Woodworth is further said to disclose a lead-free bullet, a solid lubricant additive, and graphite as an additive.

Though it is recognized that Woodworth does not disclose the frangibility characteristic of its described bullet, it is said that Woodworth's use of the same materials and approximate processing parameters would produce a bullet having characteristics similar to Applicants' bullet.

It is also recognized that Woodworth does not disclose use of graphite in the amount of 0.05 to 0.500 percent, the use of MoS<sub>2</sub>, the use of brass, the use of zinc powder, or the use of certain process parameters. However, it is said that varying the amount of lubricant is obvious, that graphite and MoS<sub>2</sub> are known equivalents and therefore their substitution is obvious, that the use of brass is obvious to improve corrosion resistance, and the selection of process parameters is within the ordinary skill to form a fully dense alloyed bullet.

These rejections are respectfully traversed.

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As above stated, Applicants' claimed invention is directed to a frangible bullet (claims 1-24, 53, and 55-66); a method of making a frangible bullet (claims 26-34, and 54); a powder useful for manufacturing a frangible item (claims 35-52); and ammunition comprising a frangible bullet (claim 25). The claimed frangible bullet comprises at least 60 percent by weight copper and is formed by pressing a copper-containing powder in a die to form a pressed powder compact which is subsequently sintered, wherein the sintering is partially impeded either

- (i) by the addition of a frangibility effecting additive to the powder (claim 1 and its dependent claims 53, and 3-24); or
- (ii) through control of density of the pressed powder compact; or
- (iii) through control of sintering temperature, or sintering time (claim 1 and dependent claims 55-66); or any combination of frangibility effecting additive addition, density control, or sintering temperature or time control, so as to produce a bullet capable of fragmenting upon impact with a target.

Applicants' claimed method for making a frangible bullet comprises pressing a powder containing at least 60 percent by weight copper in a die to form a pressed powder compact which is subsequently sintered, wherein the sintering is partially impeded either

- (i) by the addition of a frangibility effecting additive (claim 26); or
- (ii) through control of density of the pressed powder compact; or

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(iii) through control of sintering temperature or sintering time (claim 26 and dependent claims 54, and 27-34); or any combination of any of the above, so as to produce a bullet capable of fragmenting upon impact with a target.

The claimed powder useful for manufacturing a frangible item, by pressing and sintering, comprises at least about 60 percent by weight copper and a frangibility effecting additive of a select group (independent claim 35 and dependent claims 36-52).

The claimed ammunition comprises the bullet of claim 1 (claim 25).

First, it is respectfully submitted that Woodworth neither discloses nor suggests a frangible bullet. Woodworth is directed to bullets formed by sintering processes previously used to manufacture bearings and small bushings which are capable of absorbing a lubricant. These prior processes are described as:

“provid[ing] an article which will resist great crushing, pressures, and fracturing strains and which is of . . . great strength. . .”

Page 2, lines 27-29. The prior processes are further described as providing a bullet which can be caused to absorb lubricant which during firing lubricates the firearm barrel to reduce wear

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thereon. Page 2, lines 67-74.

Thus, to one skilled in the art, Woodworth discloses and teaches a bullet of high strength and crush resistance which may be impregnated with a lubricant to resist barrel wear. Nowhere does Woodworth disclose or suggest that its described bullet is frangible.

In fact, the result of following the teachings of Woodworth is NOT a frangible bullet. As set forth in the accompanying Declaration of Anil V. Nadkarni In Support of the Novelty of the Claimed Invention, submitted herewith, when bullets are manufactured in conformance with the teachings of Woodworth, the bullet is not frangible. See numbered paragraph 7, at pages 7-8, and Exhibit C of the Declaration. This is the result expected by one skilled in the art.

In contrast, the present invention is frangible bullets. As one skilled in the art would recognize, and as confirmed by the Declaration of Anil V. Nadkarni, Woodworth only teaches non-frangible bullets.

Second, it is respectfully submitted that Woodworth, in addition to not disclosing any frangible bullet, does not disclose or suggest a frangible bullet manufactured by partially impeding sintering. It particularly does not disclose sintering that is partially impeded either (i) by the

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addition of a frangibility effecting additive to said powder, or (ii) through control of density of the pressed powder compact, or (iii) through control of sintering temperature or sintering time, or any combination thereof, so as to produce a bullet capable of fragmenting upon impact with a target.

Woodworth only discloses the addition of stearic acid, boric acid and graphite to the copper and tin powders without explanation. Presumably these compounds are added to aid release from the die, to be volatile void forming substances (see page 1, lines 67-69) or to enhance lubrication when the bullet is fired. There is no disclosure or suggestion in Woodworth that any of these compounds effects frangibility or that their addition would, or even might, produce a bullet that fragments upon impact with a target.

Further, Woodworth does not disclose the use of the particular frangibility effecting additives specified in the present dependent claims.

Woodworth is similarly silent as to partially impeding sintering through control of density or sintering temperature or time, so as to produce a bullet that fragments upon striking a target. As noted above, and in the Declaration of Anil V. Nadkarni, Woodworth only discloses a process and processing conditions that provide full sintering. There is no disclosure or suggestion in Woodworth to modify its disclosed process in any manner so as to produce a bullet capable of

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fragmenting upon impact with a target.

Woodworth only discloses the manufacturing of a fully sintered 90 percent copper, 10 percent tin bullet and provides no guidance or suggestion as to how to manufacture any other type of bullet. As it is concerned only with full sintering, it particularly does not provide any instruction or guidance as to how to make any bullet frangible. Notably, Woodworth does not disclose or suggest that if its disclosed processing conditions were applied to essentially pure copper, the resultant bullet would be frangible.

These, and other, deficiencies in the disclosure of Woodworth are not cured by the disclosure of the *Condensed Chemical Dictionary*. Nowhere does the *Dictionary* disclose or suggest a frangible bullet, partially sintering to form a frangible bullet, or that any compound is useful for forming a frangible bullet.

Accordingly, it is respectfully submitted that Woodworth, either alone or in combination with the *Condensed Chemical Dictionary*, discloses, suggests or otherwise renders unpatentable Applicants' claimed invention.

Wherefore, it is respectfully requested that the rejections to the claims be reconsidered and

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withdrawn, the claims be allowed, and the application be passed to prompt issuance.

If a telephone conference would be helpful in advancing this application to issuance, the Examiner is respectfully requested to telephone Applicants' undersigned attorney at the number below provided.

A fee in the amount of \$308.00 is deemed due for the additional claims (as calculated by the Fee Claim Sheet filed in duplicate herewith) and the Patent and Trademark Office is hereby authorized to charge this fee to Deposit Account No. 11-0171. No other fee is deemed due in connection with the filing of this Response. However, if any other fee is deemed necessary, the Patent and Trademark Office is hereby authorized to charge the amount of such fee to Deposit Account No. 11-0171.

Respectfully submitted,

  
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